TRIENNIAL REVIEW

WATER QUALITY STANDARDS

Commonwealth of Virginia

Department of Environmental Quality

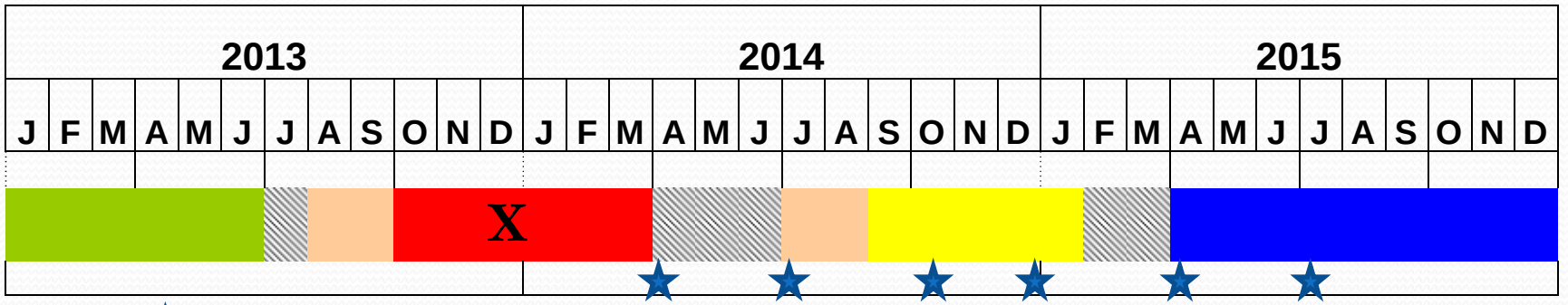
Regulatory Advisory Panel Meeting

December 13, 2013

DEQ-PRO

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

TRIENNAL REVIEW TIMELINE



Approximate time of SWCB meeting

Technical Development

DBP and Executive Review 28 Days - 14 for DPB, 14 for SNR and Gov*

NOIRA or NOPC Comment Periods

180 Days Includes Ad Hoc, Proposal Development, and go to Board

150 Days - Public Comment Review, Board Adoption

Final Stage Includes Final Publication, AGO Certification, EPA Approval

*No time limit for Gov. pre-NOPC and pre-Final stages

Agenda

- Human Health Criteria Updates
- Leftover Issues (Pb, Cd, Mn)
- Swamp Waters Reclassifications (Class VII)
- Lake Nutrient Section 187 – New Additions
- Application of Lake pH
- Wetlands Definition
- Ches. Bay D.O. Criteria vs D.O. Criteria in Section 50
- Acrolein & Carbaryl

Agenda
(continued)

- **Copper Biotic Ligand Model**
- **Bacteria Criteria**
- **Ammonia Criteria**
- **Special Standard 'hh' & Endangered Species Protection**
- **Other**

Human Health Criteria Updates

IRIS Reference Doses (RfD) for Non-Carcinogenic Toxic Pollutants Updated After the Last Virginia Triennial Review

Chemical	Date of IRIS Update	Old RfD (mg/kg body weight-day)	New RfD (mg/kg body weight-day)	Public Water Supply Criteria (µg/L) Old WQC : New WQC	All Non-PWS Waters Criteria (µg/L) Old WQC : New WQC
Nitrobenzene	2/6/2009	0.0005	0.002	17 : 68	690 : 2,800
Cyanide, free	9/28/2010	0.02	0.0006	140 : 4.2	16,000 : 480

Human Health Criteria Updates

IRIS Oral Slope Factors (Q1*) for Carcinogenic Toxic Pollutants Updated After the Last Virginia Triennial Review

Chemical	Date of IRIS Update	Old Cancer Oral Slope Factor (per mg/kg-day)	New Cancer Oral Slope Factor (per mg/kg-day)	Public Water Supply Criteria (µg/L) Old WQC : New WQC	All Non-PWS Waters Criteria (µg/L) Old WQC : New WQC
Carbon Tetrachloride	9/30/2010	0.13	0.07	2.3 : 4.3	16 : 30
Hexachloroethane	9/23/2011	0.014	0.04	14 : 5.0	33 : 12
Methylene Chloride	11/18/2011	0.0075	0.002	46 : 170	5,900 : 22,000
Pentachlorophenol	9/30/2010	0.12	0.4	2.7 : 0.80	30 : 9.1
Tetrachloroethylene	2/10/2012	0.0398	0.0021	6.9 : 130	33 : 620
Trichloroethylene	9/28/2011	0.0126	0.046	25 : 7.0	300 : 82

Human Health Criteria Updates

Chemical	Old Criteria (µg/L) Public Water Supply	Updated Criteria (µg/L) Public Water Supply	Old Criteria (µg/L) All Non-PWS Waters	Updated Criteria (µg/L) All Non-PWS Waters
Carbon Tetrachloride	2.3	4.3	16	30
Cyanide , free	140	4.2	16,000	480
Hexachloroethane	14	5.0	33	12
Methylene Chloride	46	170	5,900	22,000
Nitrobenzene	17	68	690	2,800
Pentachlorophenol	2.7	0.80	30	9.1
Tetrachloroethylene	6.9	130	33	620
Trichloroethylene	25	7.0	300	82

Revisit Left Over Issues

- **Manganese:** Natural conditions often exceed the PWS criterion.
- **Lead criteria**: slight conversion factor adjustments to express lead criteria concentrations as dissolved instead of total recoverable.
- **Cadmium:** VA will consider revising the old criteria for cadmium in freshwater based on more recent data.

Manganese (Mn)

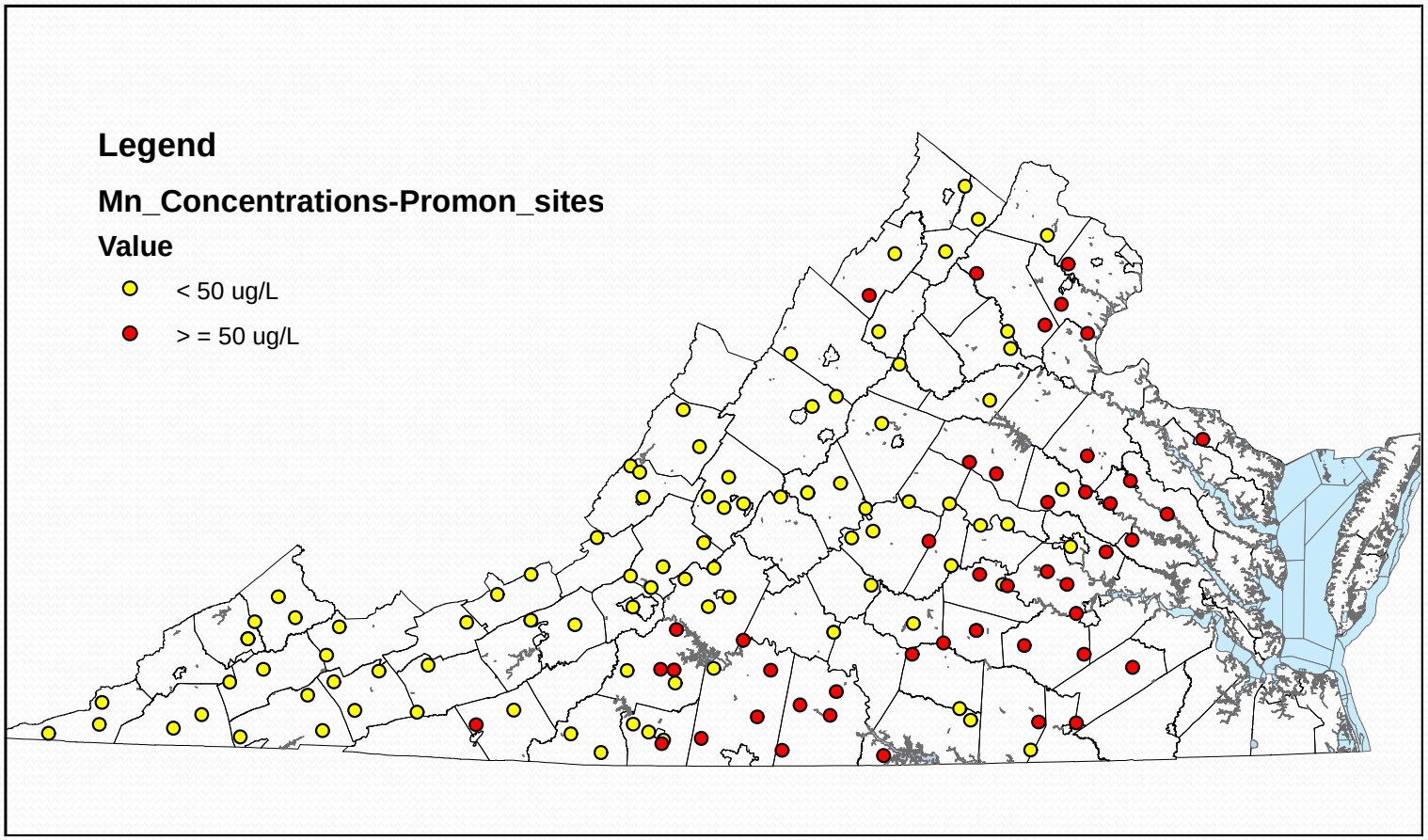
- Originated as Safe Drinking Water Act secondary maximum contaminant level for finished water
- Protect drinking water supplies from staining properties of Mn (50 ug/l)
- Expressed in WQS as total; most other metals expressed as dissolved

The Issue:

Soils & underlying geology of many regions of VA naturally high in Mn & Mn compounds

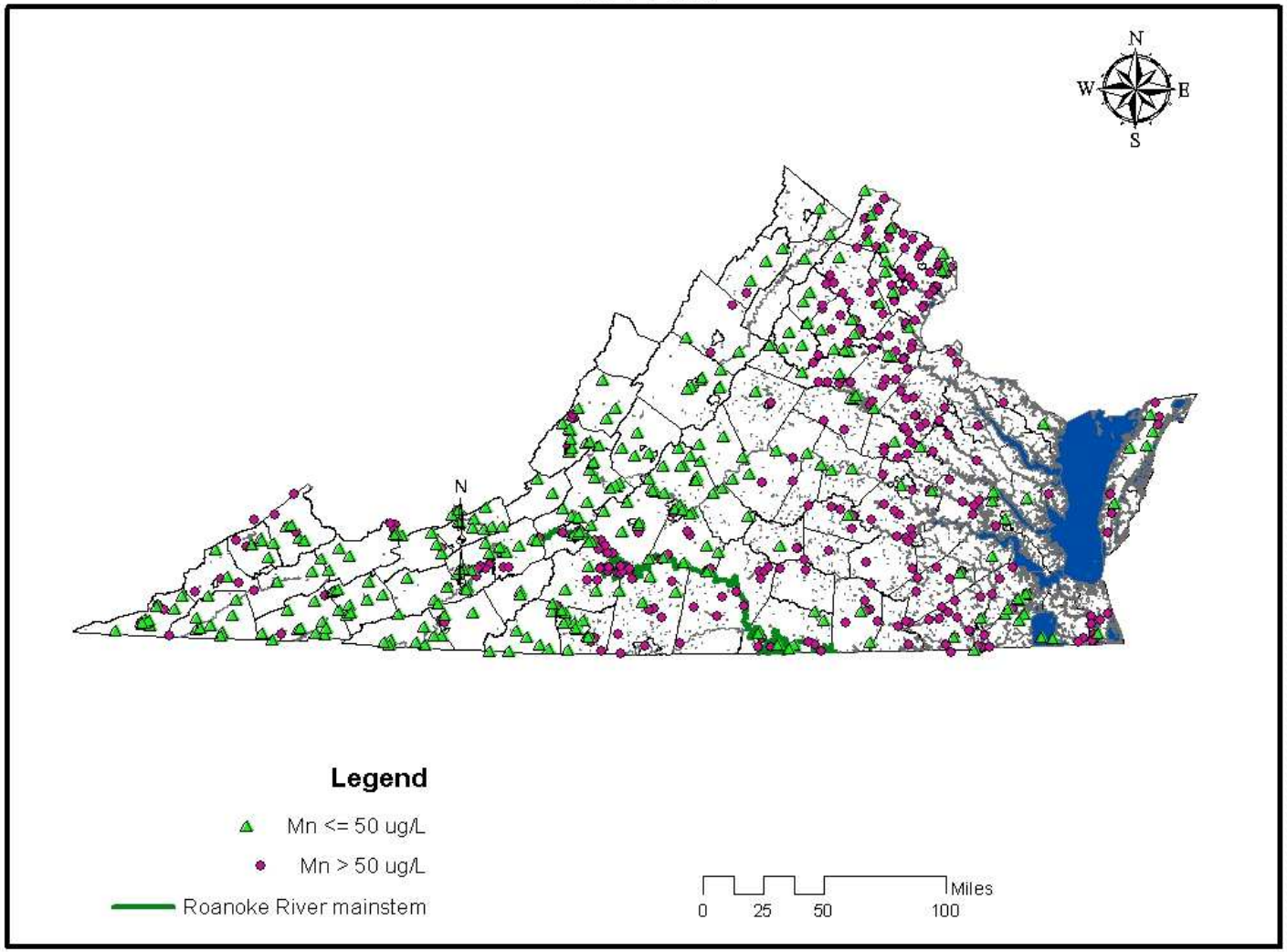
Manganese (Mn)

Mn Concentrations at ProbMon sites 2008-2010



Manganese (Mn)

Mean Mn Concentrations at all available sites 1990-2010



Lead (Pb)

Inclusion of conversion factor to express criteria as dissolved

Freshwater		Saltwater	
Acute	Chronic	Acute	Chronic
~~120~~ 94 WER = 1 C aCO_3 = 100	~~14~~ 11 WER =1 $CaCO_3$= 100	~~240~~ 230 WER=1	~~9.3~~ 8.8 WER=1

Cadmium (Cd)

Possible revision of old criteria for Cd in freshwater based on more recent data.

Freshwater	
Acute	**Chronic**
~~3.9~~ 1.8 **WER = 1** **$CaCO_3$=100**	**~~1.1~~ 0.55** **WER = 1** **$CaCO_3$ = 100**

USGS Reviewed and Recalculated Cadmium Criteria for Idaho in 2006 & Updated in 2010

- USGS added newer data to EPA 2001 dataset
- Used newer data to adjust hardness slope
- Calculated updated Acute and Chronic criteria
- Calculated FAV of 2.450 µg/L
- USGS review focused on Idaho species
- USGS FAV (and criteria) was lowered to protect the cutthroat trout SMAV 1.50 µg/L
- Cutthroat trout not in Virginia; no need to lower the FAV to 1.50

Recalculated Cadmium Criteria

- Based on entire dataset developed by USGS (2010)
- FAV = 2.450 µg/L
- *Oncorhynchus* GMAV = 2.017 µg/L
- FAV lowered to 2.017 µg/L to protect important genera (trout)

- Virginia Draft Acute Criteria based on FAV 2.017 µg/L

- Virginia Draft Chronic Criterion based on USGS chronic criterion

Draft Virginia Cadmium Freshwater Criteria

- Draft Acute criterion Equation
- $e^{(0.8403(\ln \text{Hardness}) - 3.278}$
- (no total to dissolved conversion factor needed)

- Draft Chronic Criterion Equation
- $e^{(0.6247(\ln \text{Hardness}) - 3.384}$
- EPA conversion factor
- = 1.101672-((ln hardness) x 0.041838))

Comparison of Criteria Values

Source of Criteria	Acute @ 100 hardness	Chronic @ 100 hardness
Current Virginia (EPA 1984)	3.9	1.1
EPA (2001)	2.0	0.25
Draft Virginia (2013)	1.8	0.55

Swamp Waters Reclassifications

9 VAC 25-260-50, 390 – 540

- **Designate 20 waters as Class VII**

(Swamp Waters)

Natural Conditions Report for Each Available from Rulemakings Web Page

Lake Nutrient Section 187 New Additions

- Lake Orange – DGIF-owned impoundment in Orange Co., warmwater fishery
- Powhatan Lakes, Upper & Lower – DGIF-owned in Powhatan Co. (dams breached in 2004, repaired and refilled in 2008), warmwater fishery

Application of Lake pH

9VAC25-260-50

******For a thermally stratified man-made lake or reservoir in Class III, IV, V or VI waters that are listed in 9VAC25-260-187, these dissolved oxygen and pH criteria apply only to the epilimnion of the water body. When these waters are not stratified, the dissolved oxygen and pH criteria apply throughout the water column.**

Organic decomposition creates organic acids. When combined w/ relatively high CO2 concentrations resulting from anaerobic decomposition, the CO2 dissociates into carbonic acid. Minimal buffering capacity at lake bottom results in acidic conditions.

Wetlands Definition

- *"**Wetlands**" are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."*

(Same as definition in Virginia Water Protection Permit Program Regulation, 9VAC25-210-10)

Bay D.O. Criteria (Section 185) vs D.O. Criteria in Section 50

9VAC25-260-185. Criteria to protect designated uses from the impacts of nutrients and suspended sediment in the Chesapeake Bay and its tidal tributaries.

9VAC25-260-50. Numerical criteria for dissolved oxygen, pH, and maximum temperature.

<u>Language needed to indicate which takes precedence.</u>

New EPA Recommendation Aquatic Life Criteria:

- **Acrolein (biocide)**: current VA criterion = 9.3 ug/l (for human health protection)
  - criterion final in August 2009
  - Acute & Chronic for FW ALU = 3.0 micrograms/liter

- **Carbaryl (pesticide Sevin®™)**: no current VA criterion
  - criterion final in May 2012
  - Recommended = 2.1 ug/l in freshwater (acute & chronic) & 1.6 ug/l in saltwater (acute only)

Biotic Ligand Model for Copper Freshwater Aquatic Life

EPA presents two options for adoption of the BLM: incremental and state-wide.

- Current DEQ monitoring program not designed to acquire all BLM parameters
- Include in WQS as site specific option similar to WER?
- Where in WQS to include?

Additional info at:

http://water.epa.gov/learn/training/standardsacademy/blm_index.cfm

& http://www.hydroqual.com/wr_blm.html

Biotic Ligand Model for Copper

Ranges of Input Parameters Used to Develop the Copper BLM

Parameter	Lower Bound	Upper Bound
Temperature (°C)	10	25
pH	4.9	9.2
DOC (mg/L)	0.05	29.65
Calcium (mg/L)	0.204	120.24
Magnesium (mg/L)	0.024	51.9
Sodium (mg/L)	0.16	236.9
Potassium (mg/L)	0.039	156
Sulfate (mg/L)	0.096	278.4
Chloride (mg/L)	0.32	279.72
Alkalinity (mg/L)	1.99	360

Source: HydroQual, 2005

- **EPA suggests a possible starting point of at least one sampling event per season.**
- **Spatial variability should also be considered in determining sample locations.**

New Bacteria Criteria

EPA's 2012 RWQC recommendations to protect primary contact recreation consist of a magnitude, duration and frequency of exceedance.

- **Magnitude: GM and the STV (regardless of the sample size).**
- **Duration and Frequency: The waterbody GM should not be greater than the selected GM magnitude in any 30-day interval. There should not be greater than a ten percent excursion frequency of the selected STV magnitude in the same 30-day interval.**

Criteria Elements	EPA Recommendation 1	Theoretical Illness Rate (STV) (36/1000 illness rate) STV same as current SSM criteria	Alternate EPA Recommendation 2	Theoretical Illness Rate (STV) (32/1000 illness rate) Slightly more stringent
Indicator (freshwater)	Geometric Mean (GM) cfu/100 ml	Statistical Threshold Value (STV) cfu/100 ml (10% exceedence)	GM (cfu/100 ml)	STV (cfu/100 ml) (10% exceedence)
Virginia criterion E. coli	126	235 Single sample maximum (SSM)		
EPA 2012 E. coli	126	410 (STV)	100	320 (STV)
Indicator (marine water)	Geometric Mean (GM) cfu/100 ml	Statistical Threshold Value (STV) cfu/100 ml (10% exceedence)	GM (cfu/100 ml)	STV (cfu/100 ml) (10% exceedence)
Virginia criterion Enterococci	35	104 Single sample maximum (SSM)		
EPA 2012 Enterococci	35	130 (STV)	30	110 (STV)

New Bacteria Criteria

Current & 2012 criteria would result in approx. the same number of notifications. Public would be "exposed" to similar water quality since beaches would be open at nearly the same rate with either criteria. However, the increase in the number of impairments (mostly caused by a single daily excursion) would create a significant financial and workload burden (TMDLs) with no obvious public health benefit.

"The number of samples, to be collected by a state in determining if WQS have been exceeded, is not an approvable element of a WQS package (Florida Public Interest Research Group vs. EPA, 2007)." (EPA, Recreational Water Quality Criteria, 2012)

New EPA Recommendation Ammonia Criteria for Protection of Aquatic Life

- EPA criteria document provides for recalculation procedure for site-specific criteria derivation (mussels absent)
- DEQ staff meeting w/ DGIF/DCR/USFWS RE: mussel distribution in VA

- Discussion?

Site Specific Standard ‘hh’

- Adjust application of temperature criteria to winter-only stockable streams during summer
- Address USFWS concerns re: application of max. temp Class IV waters (Mountainous Zone) May-Oct. is protective of Roanoke logperch
- DEQ staff conferred w/ DGIF/DCR/USFWS 12/11

Site Specific Standard 'hh'

Options?

- Lower max. temp for sp. std. 'hh'?
- Reiterate language from section 60 re: 'rise above natural temperature' in sp. std. 'hh'?
- If so…rise above natural temps shall not exceed 3°C or 1°C?

Site Specific Standard 'hh'

- **9VAC25-260-60. Rise above natural temperature.**

Any rise above natural temperature shall not exceed 3°C except in the case of Class VI waters (natural trout waters), where it shall not exceed 1°C. However, the board can, on a case-by-case basis, impose a more stringent limit on the rise above natural temperature. Natural temperature is defined as that temperature of a body of water (measured as the arithmetic average over one hour) due solely to natural conditions without the influence of any point-source discharge.

- **9VAC25-260-70. Maximum hourly temperature change.**

The maximum hourly temperature change shall not exceed 2°C, except in the case of Class VI waters (natural trout waters) where it shall not exceed 0.5°C. These criteria shall apply beyond the boundaries of mixing zones and are in addition to temperature changes caused by natural conditions.

Issues Identified Through NOIRA Comment Received

- **Add definition of "pollution"**

"Pollution" means man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water.

(Same as definition in Federal Clean Water Act, Sect. 502, Genl. Definitions)

Issues Identified Through NOIRA Comment Received

- **General narrative criteria – suggested revision**

A. State waters, including wetlands, shall be ~~free~~ protected from ~~substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations~~ pollution which contravenes established standards or interferes directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.

Issues Identified Through NOIRA Comment Received

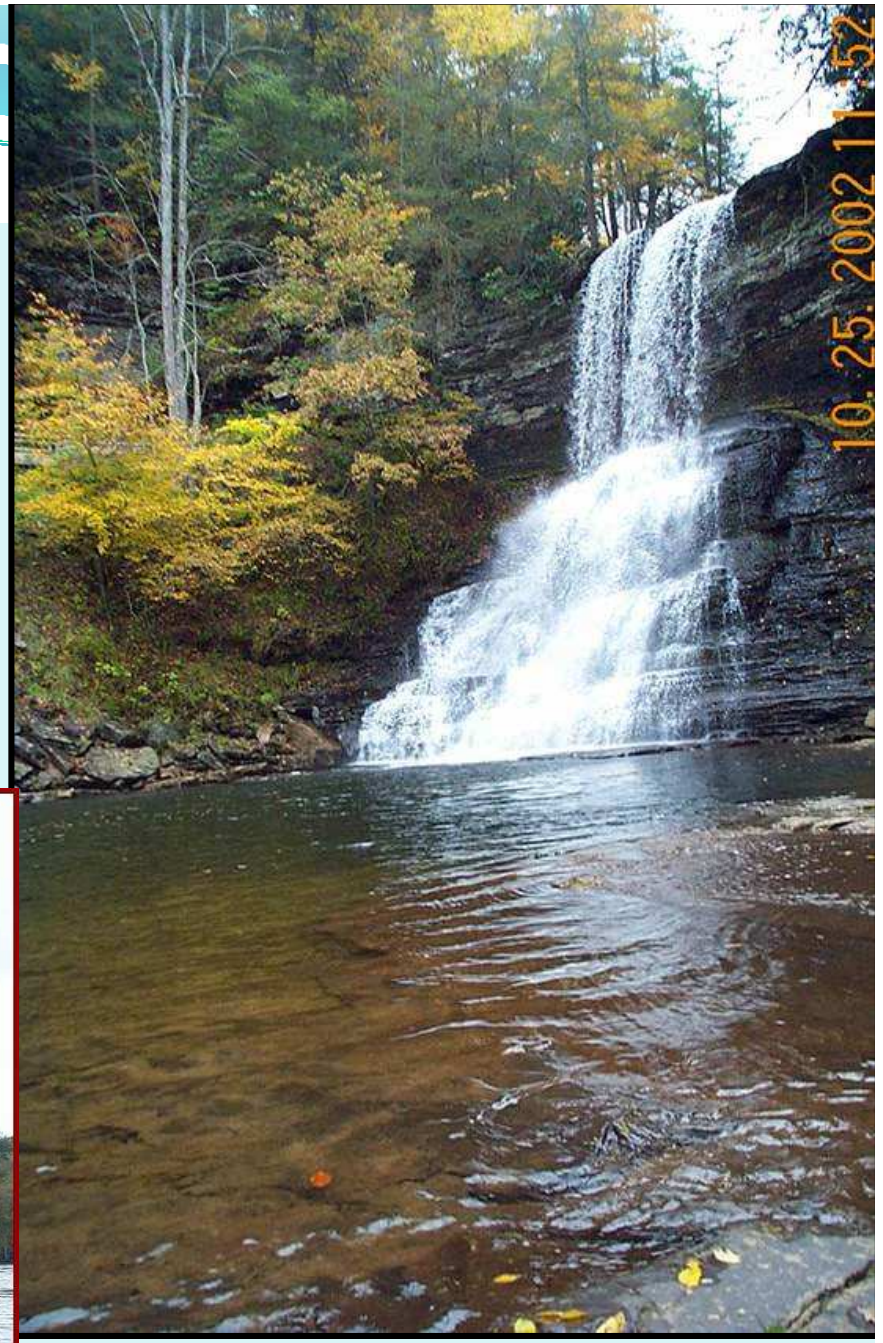
- **Revise Selenium Criteria – FW Aquatic Life**
- **Clarify SCI only for monitoring & assessment. ..not for permitting or enforcement**
- **Adopt Bromide Criterion for PWS**
- **Adopt BLM-derived Zinc criteria – FW aquatic life**

Issues Identified Through NOIRA Comment Received

- **Promulgate numeric criteria for nutrients and sediment.**
- **Address alteration of stream flow regimes through WQS regulation**
- **No human health criteria revisions based on RfDs IRIS has indicated low degree of confidence**
- **No mixing zones where T&E species present**

Issues Identified Through NOIRA Comment Received

- **Lower Cyanide FW criteria based on recent report: "Scientific Review of Cyanide Ecotoxicology and Evaluation of Ambient Water Quality Criteria: Final Report" (January 2007)**
- **Methyl mercury fish tissue criterion: evaluate for protectiveness of T&E species; not just human health**
- **Clarify special standard 'm'; effluent limitations for *Municipal* WWTF in Chickahominy above Walker's Dam**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Public Water Supply

9 VAC 25-260- 390 – 540

Suggested PWS deletions due to intake closures

James Basin

1o	II	PWS, bb	James River from City Point (Hopewell) to a point 5 miles above American Tobacco Company's raw water intake
12i	IV	PWS	Dunlap Creek and its tributaries from the Covington Boys Home raw water intake to points 5 miles upstream.

Potomac Basin

7f	III	PWS,g	The Quantico Marine Base Camp Upshur and its tributaries' raw water intake on Cedar Run (located approximately 0.2 mile above its confluence with Lucky Run) to points 5 miles upstream.

Public Water Supply

Suggested PWS deletions due to intake closures

2a IV PWS,v New River from Radford Army Ammunition Plant's raw water intake (that intake which is the further downstream), upstream to a point 5 miles above the Blacksburg-Christiansburg, V.P.I. Water Authority's raw water intake and including tributaries in this area to points 5 miles above the respective raw water intakes.